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An Annotated Review of Tritrophic Associations of Aphid Parasitoids (Hymenoptera, Braconidae, Aphidiinae) in Korea

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Abstract As a first step toward a more comprehensive research on the taxonomy of Korean aphidiine species which are parasitic on the aphids, all the available records on their hosts and collecting data were reviewed. A list of 62 species is arranged according to the generic and then specific names alphabetically with hosts records and the host-parasitoid relationships were presented.

Key words Aphidiinae, Braconidae, host, parasitoid, Korea

INTRODUCTION

Aphid pest problems and the need for more environment-friendly control measures have stimulated research activities on their natural enemies, including the parasitoids, in many parts of the world. Though good results have been achieved in some control programs, overall research on the group is still needed because of the lacks of the fundamental informations, especially in Korea. Search for potentially available biological agents is the first and the most important step in the process of the biological control. The Aphidiinae are specific parasitoids of aphids, and they are one of the subfamilies of Braconidae, Ichneumonoidea. But their taxonomic status is not studied well as a family or a subfamily level. Therefore, Aphidiinae and Aphidiidae are mixed up. In spite of the unique geographic position of Korea, the insect fauna of the country is not studied well, especially on the natural enemies. Though "Checklist of Insects from Korea" is enumerated all species of the group, most records of aphidiine species were cited from occasional papers and the members of this taxon are almost ignored even in a survey on the fauna of a certain area. Moreover, host relationship is not adjusted, though it is very important character for a parasitoid. Therefore the authors tried to check all the available informations on the Korean aphidiine species, and to serve a fundamental step for finding useful biological control agents in Korea. Relatively little is known about the Aphidiinae from the Far East of the Russian federation (Starý, 1965; Kiriac,

1979). The information from the coastal areas of China is almost none, except for those from Hong Kong (Starý & Schlinger, 1967) and Taiwan (Chou, 1981, 1984; Liu, 1975). Possible migration routes of aphid parasitoids across the East China Sea in relation to Japan were dealt with by Mochida & Takada (1978). However, most informations come from Japan (see Takada, 1968, and a set of his papers with joint-authors; Starý, 1975; Yamauchi & Takada, 1978). A number of Korean records indicate that, in spite of only a small number of species determined, the faunal relationships would be rather wider, after carrying out a broad-scale research. Some preliminary analyses of the zoogeographical classification and faunal relationships of the Korean aphidiines were done by Starý (1970), Starý & Schlinger (1967), and Paik (1975). As far as we know, the first evidence on the taxon was on the matter of a parthenogenetic population of *Ephedrus persicae* by Schlinger & Hall (1960). Starý (1965) presented a general information on several species in South Korea within a framework of an overall study on the parasitoids of the former U.S.S.R. (Far East). Starý & Schlinger (1967) published a book on the Far East Asian Aphidiidae, including a considerable information from South Korea as well; keys to the genera and species are involved. Some general informations were found in the world list of the Aphidiidae (Mackauer & Starý 1967), and in the world catalogue (Mackauer 1968). Starý (1975) summarized the information on the Far East Asian Aphidiidae, including those of the Korean peninsula. Paik (1975, 1976) published the first papers pertaining solely to the aphidiids of Korea, including the keys and redescriptions of the known species. Takada (1976, 1979) elaborated the collections taken by the expeditions of the Hungarian National Museum to North Korea. The relatively recent information on the aphidiids came from Chang & Youn (1983a) and Chang, Lee & Youn (1994) and it covered the aphidiid guild associated with *Aphis glycines* and *A. craccivora*. Some general evidence on some species are also involved in the review of parasitoid biocontrol agents of virus vectors on papaya and citrus (Takada, 1992).

The overall information on the Korean aphidiines can be divided into following four groups: 1) Occasional reference on some parasitoid species: Schlinger & Hall (1960), Starý (1965), Takada (1992), Kiriac (1993); 2) Biosystematic studies at various levels, based on swept and/or reared material: Star & Schlinger (1967), Starý (1975), Paik (1975, 1976), Takada (1976, 1979); 3) World information: Mackauer & Starý (1967), Mackauer (1968); 4) Parasitoid guilds on individual pest aphid species: Chang & Youn (1983a, 1983b, 1986), Chang *et al.* (1994).

Analyses of individual papers showed a mixture of variable qualities from obvious errors to useful informations. A part of the errors came out from the historical development of researches. On the other hand, there are errors obviously due to a poor knowledge on the group. Namely, the geographical position of Korea and research knowledge on the taxon in the Far East area have played an important role. In the former records of Korean aphidiines, European species, East Palaearctic to Oriental species, even Nearctic faunal elements were mixed together. In general, such a confusion may be presumed but it is questionable whether the species is truly conspecific or seems to fit to the descriptions, often unclear or incomplete. Commonly, this feature is obvious from the taxonomic status and/or host of a parasitoid species, or both. The authors, therefore, have tried to add some notes on the aforementioned problems in the list of parasitoids.

In the list, the species were arranged alphabetically and followed by host aphids with its record, and

plant if available. Abbreviations used: NK - North Korea (Democratic People's Republic of Korea); SK - South Korea (Republic of Korea); QR - Questionable record; ER - Obviously erroneous record.

MATERIAL AND METHODS

All the informations on the Korean aphidiids were gathered from the records and specimens as much as possible. Aphid nomenclature followed Eastop & Hille Ris Lambers (1976) and Remaudiére & Remaudiére (1997).The authors tried to indicate the collected localities accurately. The localities, therefore, were written as in the references, and, in some cases, present localities followed the rule for "Romanize Korean" were added in parenthesis.

LIST OF SPECIES

Genus *Adialytus* Förster

***Adialytus salicaphis* (Fitch)**

Aphis craccivora Koch: [ER] [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Chaitophorus matsumurai Hille Ris Lambers: [SK] Seoul, V-61, on *Salix* sp. (Starý & Schlinger, 1967).

Chaitophorus populeti coreanus Okamoto et Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Chaitophorus saliniger Shinji: [SK] the vicinity of Daejeon and Mt. Gyeryong, (Chang & Youn, 1983b, written as *C. chinensis* Takahashi).

Unknown host: [SK] (Starý, 1965)

Note: This species was commonly placed under *Lysiphlebus*. Chang and Youn (1983a) incorrectly indicated this as new to Korea.

Genus *Aphidius* Nees

***Aphidius absinthii* Marshall**

Macrosiphoniella formosartemisiae Takahashi: SK-Seoul, 9-V-61, on *Artemisia manischmidtiana* (Starý & Schlinger, 1967).

Macrosiphoniella sanborni (Gillette): [SK] Seoul, 9-V-61, on *Chrysanthemum* sp. (Star & Schlinger, 1967).

Macrosiphoniella yomogifoliae (Shinji): [SK] Seoul, 9-V-61, on *Artemisia manischmidtiana* (Star & Schlinger, 1967).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Unknown hosts: [NK] Pyongyan (= Pyeongyang), hotel garden, prov. S. Pyongan (= Pyeongan- nam-do), 6-7-IX-71 (Takada, 1976); Botanical garden, Pyongyan (= Pyeongyang), prov. S. Pyongan (= Pyeongannam-do) 3-VIII-75; Za-mo san (= Mt. Jamosan), 60 km NE from Pyongyan (= Pyeongyang)

Bek-sung-li (=?Baegjog-ri), prov. Pyong-sung (= ?Pyeong- seong in Pyeongannam-do) 1-10-VIII-75 (Takada, 1979). [SK] (Starý, 1965).

***Aphidius coloratus* Baker** [ER]

Macrosiphoniella spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the record of Korea is maybe due to a misidentification.

***Aphidius ervi* Haliday**

Unknown hosts: [SK] Milyang, 10-VI-75 (Paik, 1976).

***Aphidius gifuensis* Ashmead**

Aphis glycines Matsumura: [SK] (Paik, 1975).

Aphis gossypii Glover: [SK] (Paik, 1975).

Aulacorthum solani (Kaltenbach): [SK] (Paik, 1975).

Aulacorthum sp.: [SK] (Paik, 1975).

Macrosiphoniella pseudoartemisiae Shinji: [SK] (Paik, 1975).

Macrosiphoniella sanborni (Gillette): [SK] (Paik, 1975).

Myzus persicae (Sulzer): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61, on *Malva* sp.; ditto, 5-V-61, on *Citrus sinensis* (Starý & Schlinger, 1967); Suweon, Kwangneung (= Gwangleung) (Paik, 1975).

***Aphidius longipetiolus* Takada** [QR]

Acyrthosiphon pisum (Harris): [SK] Pyungtaek (= Pyeongtaeg), 30-IV-75, on *Medicago sativa* (Paik, 1976).

Macrosiphoniella pseudoartemisiae Shinji: [SK] Kwangneung (= Gwangleung), 29-V-75, on *Artemisia* sp. (Paik, 1976).

Note: The species status of *A. absinthii, A. longipetiolus* and other similar species in the Far East is needed to be verified in details.

***Aphidius pisivorus* Smith** [ER]

Aphis pisi (Harris): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Macrosiphoniella yomogifoliae (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Note: This is a Nearctic species, and the record of this species in Korea is probably due to a misidentification.

***Aphidius ribis* Haliday**

Cryptomyzus taoi Hille Ris Lambers: [SK] Suweon, 5-VI-75, on *Ribes fasciculatum chinense* (Paik, 1976).

***Aphidius salicis* Haliday**

Cavariella salicicola (Matsumura): [SK] Seoul, 9-V-61, on *Salix* sp. (Starý & Schlinger, 1967).

***Aphidius urticae* Haliday**

Macrosiphum corylicola (Shinji): [SK] Suweon, 25-V-75, on *Corylus heterophylla japonica;* Seoul, 23-VI-75, on *Corylus heterophylla japonica* (Paik, 1976).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1600 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 25-VIII-71 (Takada, 1976).

Note: A species complex may be involved in this nominal species.

***Aphidius* sp.**

Macrosiphum rosae Linne: [SK] Seoul, 15-V-61, on *Rosa* sp. (Starý & Schlinger, 1967).

Genus *Areopraon* Mackauer

***Areopraon* sp.**

Unknown host: [NK] Lyong-Ak San (= Mt. Yongagsan), 14km W from Pyongyan (= Pyeong- yang), prov. S. Pyongan (= Pyeongannam-do), 11-VIII-71 (Takada, 1976).

***Areopraon* sp.**

"*A.* sp." was erroneously listed (Starý & Schlinger, 1976) as a parasitoid of *Periphyllus* sp., instead of *Praon* sp. (Starý, 1975b).

Genus *Betuloxys* Mackauer

***Betuloxys* sp.**

Tuberculatus querciformosanus (Takahashi): [SK] Seoul, 24-V-75, on *Quercus crispula* (Paik, 1976).

Tuberculatus stigmatus (Matsumura): [SK] Mt. Gyeryong, 3-VI-75, on *Quercus dentata* (Paik, 1976).

Genus *Binodoxys* Mackauer

***Binodoxys communis* (Gahan)**

Aphis gossypii Glover: [SK] Suweon, 13-V-75, on *Rubia akane* (Paik, 1976).

***Binodoxys indicus* Subba Rao**

Aphis gossypii Glover: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Chaitophorus populeti coreanus Okamoto et Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Macrosiphum euphorbiae (Thomas): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Binodoxys nearctaphidis* Mackauer** [ER]

Aphis craccivora Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, a parasite of *Roepkea bakeri* Cowen in the eastern U.S. (see Mackauer & Starý, 1967), and is recorded in Korea, maybe due to a misidentification.

***Binodoxys odinae* Paik**

Toxoptera odinae (van der Goot): [SK] Mt. Gyeryong, 18-VI-75, on *Rhus javanica,* holotype ♀, paratypes (Paik, 1976).

***Binodoxys orientalis* (Starý & Schlinger)**

Sitobion ibarae (Matsumura): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

***Binodoxys* sp.**

Unknown hosts: [NK] Go-Song Chon, upper reaches of brook below hotel, Kumgang San (= Mt. Geumgangsan), prov. Kanwon (= Gangwon-do), 30-V-70 (Takada, 1976).

Genus *Boreogalba* Mackauer

***Boreogalba gladifer* Mackauer** [ER]

Aulacorthum solani (Kaltenbach): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Macrosiphoniella yomogifoliae (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the Korean record is probably due to a misidentification.

Genus *Diaeretiella* Starý

***Diaeretiella rapae* (M'Intosh)**

Brevicoryne brassicae (Linne): [SK] (Paik, 1975).

Lipaphis erysimi (Kaltenbach): [SK] (Paik, 1975).

Myzus persicae (Sulzer): [SK] (Paik, 1975); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Unknown hosts: [NK] San-Gan Po, 30 Km N from Pyongyang (= Pyeongyang), prov. S. Phenan (= Pyeongannam-do), 24-V-70 (Takada, 1976).

Genus *Diaeretus* Förster

***Diaeretus leucopterus* (Haliday)**

Eulachnus thunbergii (Wilson): [SK] Seoul, 3-V-61, on *Pinus* sp. (Starý & Schlinger, 1967)

Unknown hosts: [SK] (Starý, 1965).

Genus *Ephedrus* Haliday

Ephedrus californicus Baker [ER]

Macrosiphum euphorbiae (Thomas): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Uroleucon formosanum (Takahashi): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the record of this species in Korea is probably due to a misidentification.

***Ephedrus nacheri* Quilis**

Cryptosiphum artemisiae Buckton: [SK] (Paik, 1975).

Hyalopterus pruni (Geoffroy): [SK] (Paik, 1975).

***Ephedrus niger* Gautier, Bonnamour and Gaumont (= *Ephedrus campestris* Starý)**

Macrosiphoniella sanborni (Gillette): [SK] Seoul, 9-V-61, on *Chrysanthemum* sp. (Starý & Schlinger, 1967).

Macrosiphoniella yomogifoliae (Shinji): [SK] Seoul, 9-V-61, on *Artemisia manischmidtiana* (Starý & Schlinger, 1967).

Megoura viciae Buckton: [SK] Seoul, 9-V-61, on *Vicia* sp. (Starý & Schlinger, 1967).

***Ephedrus persicae* Froggatt**

Aphis glycines Matsumura: [SK] Taejon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

Aphis gossypii Glover: [SK] (Schlinger & Hall, 1960); Cheju-do Isl. (= Isl. Jejudo), 6-V-61 (Starý & Schlinger, 1967).

Brachycaudus sp.: [SK] (Paik, 1975).

Myzus malisuctus Matsumura: [SK] (Paik, 1975).

Myzus persicae (Sulzer): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61, on *Prunus* sp. (Starý & Schlinger, 1967); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Sitobion avenae (Fabricius): [SK] (Paik, 1975).

Tuberocephalus momonis (Matsumura): [SK] (Paik, 1975).

***Ephedrus plagiator* (Nees)**

Amphicercidus japonicus (Hori): [SK] Seoul, 9-V-61, on *Lonicera* sp. (Starý & Schlinger, 1967).

Aphis glycines Matsumura: [SK] Taejon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

Aphis gossypii Glover: [SK] (Paik, 1975).

Aphis spp.: [SK] Seoul, 9-V-61, on *Prunus* sp. (Starý & Schlinger, 1967); (Paik, 1975).

Cryptosiphum artemisiae Buckton: [SK] (Paik, 1975).

Myzus malisuctus Matsumura: [SK] (Paik, 1975).

Phorodon humuli japonensis Takahashi: [SK] (Paik, 1975).

Rhopalomyzus sp.: [SK] (Paik, 1975).

Sitobion ibarae (Matsumura): [SK] (Paik, 1975).

Uroleucon gobonis (Matsumura): [SK] (Paik, 1975).

Unknown hosts: [NK] San-Chon Tong, about 20 Km SE from Kaesong (= Gaeseong), Bagyon San (= Mt. Bagyeonsan), prov. Kengi (= Gyeonggi-do), 8-VI-70; Sam-Zi-Yan (= Samjiyeon), 1600 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-gang (= Yanggang-do), 28-VIII-71 (Takada, 1976); Plateau Chann-Pay (= Jangbaeg), 24 Km NW from Sam-Zi-Yan (= Samjiyeon), prov. Ryang-Gang (Yanggang-do), 24-VIII-75 (Takada, 1979).

***Ephedrus* spp.**

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1500 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 24-VIII-71 (Takada, 1976).

Genus *Euaphidius* Mackauer

***Euaphidius areolatus* Ashmead**

Macrosiphoniella pseudoartemisiae Shinji: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Periphyllus spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Euaphidius cingulatus* (Ruthe)**

Aphis glycines Matsumura: [QR] [SK] Taejon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

Macrosiphoniella yomogifoliae (Shinji): [QR] [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Myzus persicae (Sulzer): [QR] [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Pterocomma spp.: [SK] the vicinity of Daejeon & Mt. Gyeryong (Chang & Youn, 1983b).

Note: This species is a specific parasite of *Pterocomma*-aphids, but almost all the former records are from another hosts. It is, therefore, needed to be verified again.

Genus *Fissicaudus* Starý and Schlinger

***Fissicaudus* sp. (as *Binodoxys*)**

Greenidea nipponica Suenaga: [SK] Suweon, 19-VI-75, on *Quercus* sp. (Paik, 1976).

Genus *Lipolexis* Förster

***Lipolexis gracilis* Förster**

Aphis glycines Matsumura: [SK] (Paik, 1975).

Aphis spiraecola Patch: [SK] (Paik, 1975).

Unknown hosts: [NK] Mang-Young-Dae (= Mangyeongdae), prov. S. Pyongan (= Pyeongannam-do), 5-VIII-71; Pyongyan (= Pyeongyang), hotel garden, prov. S. Pyongan (= Pyeongannam-do), 31-VIII-71; ditto, 6-7-IX-71; Pyongyan (= Pyeongyang), city park, prov. S. Pyongan (= Pyeongannam-do), 1-IX-71 (Takada, 1976).

***Lipolexis scutellaris* Mackauer**

Aphis craccivora Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Genus *Lysaphidus* Smith

***Lysaphidus pleotrichophori* Takada**

Pleotrichophorus glandulosus (Kalt.): [SK] Suweon, 10-VII-75, on *Artemisia* sp. (Paik, 1976).

Genus *Lysephedrus* Starý

***Lysephedrus validus* (Haliday)**

Eriosomatine aphids: [SK] Seoul, 9-V-61, on *Apium* sp., roots (Starý & Schlinger, 1967).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Genus *Lysiphlebia* Starý and Schlinger

***Lysiphlebia japonica* (Ashmead)**

Aphis craccivora Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a).

Aphis gossypii Glover: [SK] (Paik, 1975).

Aphis ichigo Shinji: [SK] (Paik, 1975).

Aphis sambuci Linne: [SK] Seoul, 9-V-61, on *Sambucus* sp. (Starý & Schlinger, 1967).

Aphis spiraecola Patch: [SK] Cheju-do Isl. (= Isl. Jejudo), 7-V-61, on *Citrus sinensis;* Seoul, 9-V-61,

on *Crataegus pinnatigida;* Seoul, 9-V-61, on *Spiraea* sp. (Starý & Schlinger, 1967).

Aphis sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis,* (Starý & Schlinger, 1967).

Aulacorthum solani (Kaltenbach): [SK] (Paik, 1975).

Melanaphis sacchari (Zehntner): [SK] (Paik, 1975).

Melanaphis sp.: [SK] (Paik, 1975).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Tetraneura sp.: [SK] Seoul, 9-V-61, on *Ulmus* sp. (Starý & Schlinger, 1967).

Toxoptera odinae (van der Goot): [SK] (Paik, 1975).

Unknown hosts: [NK] Mang-Young-Dae (= Mangyeongdae), prov. S. Pyongan (= Pyeongannam-do), 5-VIII-71 (Takada, 1976).

Note: This species has been commonly listed under *Lysiphlebus.*

***Lysiphlebia rugosa* Starý and Schlinger**

Aphis craccivora Koch: [SK] (Paik, 1975)

Aphis sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis,* paratypes (Starý & Schlinger, 1967).

Genus *Lysiphlebus* Förster

***Lysiphlebus ambiguus* (Haliday)** [ER]

Aphis craccivora Koch: [SK] Suweon, 19-V-70, on *Hemistepsa lyrata* (Paik, 1976); the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a).

Note: Due to priority reasons, the true *L. ambiguus* (Hal.) is a West-Palearctic and Oriental species, a parasitoid of *Sipha*-aphids. This material probably belongs to *L. confusus* Tremblay and Eady group.

***Lysiphlebus* sp. aff. *delhiensis* Subba Rao and Sharma**

Aphis sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis* (Starý & Schlinger, 1967).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Note: This is probably a species of *L. confusus* group.

***Lysiphlebus delhiensis* Subba Rao and Sharma** [QR]

Aphis craccivora Koch: [SK] (Paik, 1975).

Note: The species is known as an Oriental species of uncertain taxonomic status, but most probably belongs to *L. confusus* group.

Genus *Monoctonus* Haliday

***Monoctonus similis* Starý and Schlinger**

Myzus spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Sappahpis piri Matsumura: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Monoctonus* sp.**

Unknown hosts: [NK] Mt. Pektusan (= Baegdusan), Mu-Du-bong (= Mudubong), 2100-2200 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 25-VII-75 (Takada, 1979).

Genus *Pauesia* Quilis

***Pauesia abietis* (Marshall)**

Cinara piniformosana (Takahashi): [SK] Suweon, 24-V-74, on *Pinus densiflora* (Paik, 1976).

Unknown hosts: [NK] Si-Sung-Ho (= Sijungho (lake)), 50 km S of Wonsan (= Weonsan) seashore, prov. Kanwon (= Gangwon-do), 29-V-70 (Takada, 1976).

Note: The conspecificity of the West- and East-Palearctic material of *P. abietis* and similar species need to be verified.

***Pauesia infulata* (Haliday)**

Cinara louisianensis Boudreaux: [SK] Mt. Gyeryong, 16-VI-1975, on *Biota orientalis* (Paik, 1976).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1700 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 24-VII-75 (Takada, 1979).

***Pauesia japonica* (Ashmead)**

Lachnus tropicalis (van der Goot): [SK] Suweon, 4-V-70, on *Castanea crenata* (Paik, 1976).

***Pauesia jezoensis* (Watanabe)**

Cinara tujaphilina (del Guercio): [SK] Seoul, 24-V-75, on *Sabina chinensis horizontalis* (Paik, 1976).

***Pauesia pini* (Haliday)**

Cinara formosana (Takahashi): [SK] Seoul, 25-V-75, on *Pinus koraiensis* (Paik, 1976).

Unknown hosts: [NK] Mt. Ze-Dong (= Jedongsan), Hyesan, Prov. Ryang-Gang (= Yanggang-do), 26-VII-75 (Takada, 1979).

***Pauesia salignae* (Watanabe)**

Tuberolachnus salignus (Gmelin): [NK] Vansan (= Weonsan), 11-IX-87 (Kiriac, 1993). [SK] (Paik, 1975).

Note: Paik (1975) described this as unrecorded species in Korea.

***Pauesia unilachni* (Gahan)**

Lachnus sp.: [SK] (Paik, 1975).

Schizolachnus orientalis (Takahashi): [SK] Seoul, 8-V-61, on *Pinus* sp. (Starý & Schlinger, 1967); (Paik, 1975).

Unknown hosts: [SK] (Starý, 1965).

***Pauesia* sp.**

Unknown hosts: [NK] Si-Sung Ho (= Sijungho (lake)), 50 km S of Wonsan (= Weonsan) seashore, prov. Kanwon (= Gangwon-do), 29-V-70 (Takada, 1976).

Genus *Praon* Haliday

***Praon coreanum* Takada**

Unknown hosts: [NK] Plateau Chann-Pay (= Jangbaeg), 24 Km NW from Sam-Zi-Yan (= Samjiyeon), road to Mt. Pektusan (= Baegdusan), 2,000 m, prov. Ryang-Gang (= Yanggang-do), 24-VII-75; holotype ♀, Mt. Ze-dong (= Jedongsan), Hyesan, prov. Ryang-Gang (= Yanggang-do), 26-VII-75, paratype (Takada, 1979).

***Praon dorsale* (Haliday)**

Macrosiphoniella sp.: [SK] (Paik, 1975).

***Praon orientale* Starý and Schlinger**

Aphis spiraecola Patch: [SK] Seoul, 9-V-61, on *Crataegus pinnatigida,* paratypes (Starý & Schlinger, 1967).

Cavariella sp.: [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

Myzus persicae (Sulzer): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61. paratypes (Starý & Schlinger, 1967).

Sitobion ibarae (Matsumura): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-67, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

***Praon volucre* (Haliday)**

Phorodon humuli japonensis Takahashi: [SK] (Paik, 1975).

Sitobion ibarae (Matsumura): [SK] (Paik, 1975).

Uroleucon formosanum (Takahashi): [SK] (Paik, 1975).

***Praon yomenae* Takada**

Unknown hosts: [NK] Mts. Guk-San-Bong, 40 Km NE from Nam-Po (= Nampo), prov. S. Pyongan (= Pyeongannam-do), 5-IX-71 (Takada, 1976); Nam-Po (= Nampo), prov. S. Pyongan (= Pyeongannam -do), 19-VII-75 (Takada, 1979).

***Praon* spp.**

Aphis gossypii Glover: [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61 (Starý & Schlinger, 1967).

Eulachnus thunbergii (Wilson): [SK] Suweon, 10-VI-75, on *Pinus koraiensis;* Seoul, 24-V-75, on *Pinus koraiensis* (Paik, 1976).

Periphyllus sp.: [SK] (Starý & Schlinger, 1967; Starý, 1975b).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1500 m, plateau Chann-Pay (= Jangbaeg), prov.

Ryang-Gang (= Yanggang-do), 24-VIII-71 (Takada, 1976).

Genus *Trioxys* Haliday

Trioxys asiaticus Telenga [QR]

Acyrthosiphon gossypii Mordvilko: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Aphis medicaginis Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Macrosiphoniella yomogifoliae (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: According to Mackauer and Starý (1967), this is mainly distributed near East and central Asia, Iran and U.S.S.R.

Trioxys curvicaudus Mackauer

Tinocallis zelkowae (Takahashi): [SK] Seoul, on *Quercus* sp. (Paik, 1976).

Trioxys hokkaidensis Takada

Aphis craccivora Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Chaitophorus chinensis Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong, (Chang & Youn, 1983b).

Myzus persicae (Sulzer): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Tuberocephalus momonis (Matsumura): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Trioxys japonicus (Star and Schlinger)

Aphis gossypii Glover: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Trioxys spp.

Aphis craccivora Koch: [SK] Suweon (Paik, 1975).

Chaitophorus populeti (Panzer): [SK] Suweon, 16-VI-70, on *Populus alba* (Paik, 1976).

Tuberculatus sp.: [SK] Suweon, 16-VI-75, on *Quercus* sp. (Paik, 1976).

Unknown hosts: [NK] Lyong-Ak San (= Mt. Yongagsan), 25 km W from Pyongyan (= Pyeongyang), prov. S. Pyongan (= Pyeongannam-do), 31-VIII-71 (Takada, 1976).

List of Host-Parasitoids

Host aphid	Parasitoid
Acyrthosiphon gossypii Mordvilko	*Trioxys asiaticus* Telenga [QR]
Acyrthosiphon pisum (Harris)	*Aphidius longipetiolus* Takada [QR]
Amphicercidus japonicus (Hori)	*Ephedrus plagiator* (Nees)
Aphis craccivora Koch	*Adialytus salicaphis* (Fitch)
	Lipolexis scutellaris Mackauer
	Lysiphlebia japonica (Ashmead)
	Lysiphlebia rugosa Starý & Schlinger
	Lysiphlebus delhiensis Subba Rao & Sharma [QR]
	Trioxys hokkaidensis Takada
	Trioxys spp.
Aphis glycines Matsumura	*Aphidius gifuensis* Ashmead
	Ephedrus persicae Froggatt
	Ephedrus plagiator (Nees)
	Euaphidius cingulatus (Ruthe) [QR]
	Lipolexis gracilis Förster
Aphis gossypii Glover	*Aphidius gifuensis* Ashmead
	Binodoxys communis (Gahan)
	Binodoxys indicus Subba Rao
	Ephedrus persicae Froggatt
	Ephedrus plagiator (Nees)
	Lysiphlebia japonica (Ashmead)
	Praon spp.
	Trioxys japonicus (Starý et Schlinger)
Aphis ichigo Shinji	*Lysiphlebia japonica* (Ashmead)
Aphis medicaginis Koch	*Trioxys asiaticus* Telenga [QR]
Aphis sambuci Linne	*Lysiphlebia japonica* (Ashmead)
Aphis spiraecola Patch	*Lipolexis gracilis* Förster
	Lysiphlebia japonica (Ashmead)
	Praon orientale Starý & Schlinger
Aphis spp.	*Ephedrus plagiator* (Nees)
	Lysiphlebia japonica (Ashmead)
	Lysiphlebia rugosa Starý & Schlinger
	Lysiphlebus sp. aff. *delhiensis* S. Rao & Sharma
Aulacorthum solani (Kaltenbach)	*Aphidius gifuensis* Ashmead
	Lysiphlebia japonica (Ashmead)
Aulacorthum sp.	*Aphidius gifuensis* Ashmead
Brachycaudus sp.	*Ephedrus persicae* Froggatt
Brevicoryne brassicae (Linne)	*Diaeretiella rapae* (M'Intosh)
Cavariella salicicola (Matsumura)	*Aphidius salicis* Haliday
Cavariella sp.	*Praon orientale* Starý & Schlinger
Chaitophorus chinensis Takahashi	*Trioxys hokkaidensis* Takada
Chaitophorus matsumurai Hille Ris Lambers	*Adialytus salicaphis* (Fitch)
Chaitophorus populeti (Panzer)	*Adialytus salicaphis* (Fitch)
	Binodoxys indicus Subba Rao

Continued.

Host aphid	Parasitoid
	Trioxys spp.
Chaitophorus saliniger Shinji	*Adialytus salicaphis* (Fitch)
Cinara formosana (Takahashi)	*Pauesia pini* (Haliday)
Cinara louisianensis Boudreaux	*Pauesia infulata* (Haliday)
Cinara piniformosana (Takahashi)	*Pauesia abietis* (Marshall)
Cinara tujaphilina (del Guercio)	*Pauesia jezoensis* (Watanabe)
Cryptomyzus taoi Hille Ris Lambers	*Aphidius ribis* Haliday
Cryptosiphum artemisiae Buckton	*Ephedrus nacheri* Quilis *Ephedrus plagiator* (Nees)
Eriosomatinae spp.	*Lysephedrus validus* (Haliday)
Eulachnus thunbergii (Wilson)	*Diaeretus leucopterus* (Haliday) *Praon* spp.
Greenidea nipponica Suenaga	*Fissicaudus* sp.
Hyalopterus pruni (Geoffroy)	*Ephedrus nacheri* Quilis
Lachnus tropicalis (van der Goot)	*Pauesia japonica* (Ashmead)
Lachnus sp.	*Pauesia unilachni* (Gahan)
Lipaphis erysimi (Kaltenbach)	*Diaeretiella rapae* (M'Intosh)
Macrosiphoniella formosartemisiae Takahashi	*Aphidius absinthii* Marshall
Macrosiphoniella pseudoartemisiae Shinji	*Aphidius gifuensis* Ashmead *Aphidius longipetiolus* Takada [QR] *Euaphidius areolatus* Ashmead
Macrosiphoniella sanborni (Gillette)	*Aphidius absinthii* Marshall *Aphidius gifuensis* Ashmead *Ephedrus niger* Gautier, Bonnamour & Gaumont
Macrosiphoniella yomogifoliae (Shinji)	*Aphidius absinthii* Marshall *Ephedrus niger* Gautier, Bonnamour & Gaumont *Euaphidius cingulatus* (Ruthe) [QR] *Trioxys asiaticus* Telenga [QR]
Macrosiphoniella sp.	*Praon dorsale* (Haliday)
Macrosiphum corylicola (Shinji)	*Aphidius urticae* Haliday
Macrosiphum euphorbiae (Thomas)	*Binodoxys indicus* Subba Rao
Macrosiphum rosae (Linne)	*Aphidius* sp.
Megoura viciae Buckton	*Ephedrus niger* Gautier, Bonnamour & Gaumont
Melanaphis sacchari (Zehntner)	*Lysiphlebia japonica* (Ashmead)
Melanaphis sp.	*Lysiphlebia japonica* (Ashmead)
Myzus malisuctus Matsumura	*Ephedrus persicae* Froggatt *Ephedrus plagiator* (Nees)
Myzus persicae (Sulzer)	*Aphidius absinthii* Marshall *Aphidius gifuensis* Ashmead *Diaeretiella rapae* (M'Intosh)

Continued.

Host aphid	Parasitoid
	Ephedrus persicae Froggatt *Euaphidius cingulatus* (Ruthe) [QR] *Lysephedrus validus* (Haliday) *Lysiphlebia japonica* (Ashmead) *Lysiphlebus* sp. aff. *delhiensis* S. Rao & Sharma *Praon orientale* Starý & Schlinger *Trioxys hokkaidensis* Takada
Myzus spp.	*Monoctonus similis* Starý et Schlinger
Periphyllus sp.	*Euaphidius areolatus* Ashmead *Praon* spp.
Phorodon humuli japonensis Takahashi	*Ephedrus plagiator* (Nees) *Praon volucre* (Haliday)
Pleotrichophorus glandulosus (Kaltenbach)	*Lysaphidus pleotrichophori* Takada
Pterocomma spp.	*Euaphidius cingulatus* (Ruthe)
Rhopalomyzus sp.	*Ephedrus plagiator* (Nees)
Sappahpis piri Matsumura	*Monoctonus similis* Starý et Schlinger
Schizolachnus orientalis (Takahashi)	*Pauesia unilachni* (Gahan)
Sitobion avenae (Fabricius)	*Ephedrus persicae* Froggatt
Sitobion ibarae (Matsumura)	*Binodoxys orientalis* (Starý & Schlinger) *Ephedrus plagiator* (Nees) *Praon orientale* Starý & Schlinger *Praon volucre* (Haliday)
Tetraneura sp.	*Lysiphlebia japonica* (Ashmead)
Tinocallis zelkowae (Takahashi)	*Trioxys curvicaudus* Mackauer
Toxoptera odinae (van der Goot)	*Binodoxys odinae* Paik *Lysiphlebia japonica* (Ashmead)
Tuberculatus querciformosanus (Takahashi)	*Betuloxys* sp.
Tuberculatus stigmatus (Matsumura)	*Betuloxys* sp.
Tuberculatus sp.	*Trioxys* spp.
Tuberocephalus momonis (Matsumura)	*Ephedrus persicae* Froggatt *Trioxys hokkaidensis* Takada
Tuberolachnus salignus (Gmelin)	*Pauesia salignae* (Watanabe)
Uroleucon formosanum (Takahashi)	*Praon volucre* (Haliday)
Uroleucon gobonis (Matsumura)	*Ephedrus plagiator* (Nees)

Corrections for "Check List of Insects from Korea"

A total of 41 aphidiine species are included in "Check List of Insects from Korea". Though some species in this study are listed only by generic level, 62 species are recorded if we consider those species

as separated species. When comparing the result of this study with the species of the checklist, there is only one species, *Aphidius commodus*, not shared. The authors, however, presume it is most probably identical with *Aphidius absinthii*. There are many errors including typographic in the check list. Hereby errata are given.

Diaeretiella rapae (M'**i**ntosh)	→	*Diaeretiella rapae* (M**c**Intosh)
Ephedrus (*Ephedrus*) *persicae* Frogg**o**tt	→	*Ephedrus* (*Ephedrus*) *persicae* Frogg**a**tt
Ephedrus (*Ephedrus*) *pla**ga**tor* (Nees)	→	*Ephedrus* (*Ephedrus*) *pla**gia**tor* (Nees)
Lysiphlebus (*Phlebus*) *salicaphis* (Fitch)	→	***Adialytus*** *salicaphis* (Fitch)
*Pauesia jezo**ne**sis* (Watanabe)	→	*Pauesia jezo**en**sis* (Watanabe)
*Praon d**os**ale* (Haliday)	→	*Praon dorsale* (Haliday)
Trioxys (*Bino**b**oxys*) *communis* (Gahan)	→	*Trioxys* (*Bino**d**oxys*) *communis* (Gahan)
Trioxys (*Bino**b**oxys*) *near**act**aphidis*	→	*Trioxys* (*Bino**d**oxys*) *nearctaphidis*
Trioxys (*Bino**b**oxys*) *odinae* Paik	→	*Trioxys* (*Bino**d**oxys*) *odinae* Paik
Trioxys (*Bino**b**oxys*) *orientalis*	→	*Trioxys* (*Bino**d**oxys*) *orientalis*

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한국産 진딧물 기생봉 (벌目, 고치벌科, 진디벌亞科)의 기주 정리

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진딧물에 기생하는 한국산 진디벌에 관해서 국내외의 문헌기록을 중심으로 정리하여 10종의 학명은 잘못 사용되고 있음을 확인하였으며, 재정리한 결과 한국곤충명집에서 41종이었던 진디벌은 총 62종으로 확인되었다. 이들을 속과 종에 따라 알파벳 순으로 정리한 뒤, 각 종에 대해 기주 진딧물을 명시하였고 가능한 경우 기주가 채집된 식물도 정리하였으며, 기주 진딧물별로 기생하는 진디벌을 배열하였다.

검색어 : 진디벌아과, 고치벌과, 기주, 한국, 기생봉

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